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ABSTRACT

This guide is designed to assist curriculum developers, subject area specialists, and teachers in identifying environmental activities and learning aids appropriate for various grade levels. The guide attempts to integrate all grade levels by using the same conceptual scheme throughout the primary, intermediate, middle, and secondary levels. This conceptual scheme includes six major statements: (1) living things are interdependent with one another and their environment; (2) all organisms are interrelated through matter and energy; (3) the environment must be protected; (4) population size is regulated in nature; (5) the world is a finite system with limited resources; and (6) the available technical solutions to environmental problems must be implemented. Topics are listed under each environmental statement for each grade level thus obtaining continuity in the total program. (MR)

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Environmental Studies

CONTINUUM

K-12

INTERDISCIPLINARY ENVIRONMENTAL EDUCATION

An ESEA Title III Project
based at Nova High School
BROWARD COUNTY, FLORIDA

SE 020 918

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F O R E W O R D

This Continuum is not intended for student or teacher use in the classroom. It was prepared for the following purposes:

1. To serve as a guideline for obtaining continuity in the presentation of environmental topics.

2. To assign these topics to the most appropriate grade levels.

3. To assist curriculum developers in their efforts to design K-12 environmental studies programs.

4. To help curriculum developers in the identification of activities and learning aids appropriate to the various grade levels.

5. To assist subject area specialists in determining where their subject areas could be interrelated with environmental studies.

6. To demonstrate to the teacher participating in an environmental education program the nature and extent of involvement at various grade levels with respect to the total program.

The work presented herein was performed by the staff of the IEE Project, assisted by consultants and teachers from all grade levels and subject areas.

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A. Environment is the sum total of all factors living and non-living that influence an organism.

B. All things in the environment are constantly changing.

II. ALL ORGANISMS ARE INTERRELATED THROUGH MATTER AND ENERGY.

A. All organisms require energy which is continually supplied by the sun.

B. All organisms are interrelated through food relationships.

III. THE ENVIRONMENT MUST BE PROTECTED (FROM POLLUTION).

A. The environment is contaminated (pollution).

B. Pollution of the environment can be controlled.

IV. POPULATION SIZE IS REGULATED IN NATURE.

A. Population growth is uncontrolled.

B. Population growth must be controlled.

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A. Resources are mismanaged.

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A. Roadblocks prevent the implementation of available technological solutions.

B. Roadblocks can be removed.

P R I M A R Y

CONCEPTUAL SCHEME I

LIVING THINGS ARE INTERDEPENDENT WITH ONE ANOTHER AND THEIR ENVIRONMENT.

MAIN IDEA A

ENVIRONMENT IS THE SUM TOTAL OF ALL FACTORS LIVING AND NON-LIVING THAT INFLUENCE AN ORGANISM.

Topics

Ecology is a word coined from the Greek "oikos" and "logos" meaning "study of the home." It is the study of the inter-relationships of all living and non-living things.
Ex: Interdependency of water-soil-plant-man.

All living things require certain necessities. The environment can provide these necessities.
Ex: Air, soil, water.

The only forms of life present in an environment are those for which the environment can supply life needs.
Ex: A fish in water.

That limited area where a plant or animal can find the exact conditions necessary to sustain life is a habitat.
Ex: A fresh water pond for a frog.

In any environment one component can become a factor limiting the number and kind of organism.
Ex: Space, water, air, soil, weather, food.

Living things interacting with one another in a given environment are called a community.
Ex: Leaf-insect-bird relationships of a tree.

The community together with the non-living factors affecting that community comprise an ecosystem.
Ex: The leaf-insect-bird community of a tree together with weather, soil, water, air, and other related conditions.

MAIN IDEA B

ALL THINGS IN THE ENVIRONMENT ARE CONSTANTLY CHANGING.

Topics

All living things are constantly changing.
Ex: Growing and aging.

All non-living things are constantly changing.
Ex: Water evaporates, condenses, freezes.

The non-living environment influences the composition and behavior of the living.

The living environment influences the composition of the non-living.

The changes most important to life are those which perpetuate cycles such as the water cycle and the matter and energy cycle.

Man is interrupting portions of these cycles.
Ex: He paves the land so water cannot sink into the earth.
He makes materials which cannot be returned to the earth.

CONCEPTUAL SCHEME II

ALL ORGANISMS ARE INTERRELATED THROUGH MATTER AND ENERGY.

MAIN IDEA A

ALL ORGANISMS REQUIRE ENERGY WHICH IS CONTINUALLY SUPPLIED BY THE SUN.

Topics

The earth receives a constant input of energy from the sun.

Some of this energy is trapped by green plants and serves as the basis for life.

Energy gives organisms the ability or active strength to do things such as grow, move, play, work, reproduce, and change.

Energy from the sun gives necessary heat and light to the earth.

MAIN IDEA B

ALL ORGANISMS ARE INTERRELATED THROUGH FOOD RELATIONSHIPS.

Topics

All things that occupy space and have weight are composed of matter.

All organisms are made of matter and need matter to live.

Since there is no new matter added to the earth, matter must be used over and over.

Energy from the sun causes non-living matter (air, soil, and water) to combine together to form living matter (plants).

Animals (including man) obtain matter and energy by eating the plants or by eating other animals that have eaten plants.

The passing of energy and matter from plant to animal or from plant to animal to larger animal is sometimes called a food chain.
Ex: Leaf, insect, bird.

CONCEPTUAL SCHEME II - MAIN IDEA B - Topics (Cont'd.)

When plants and animals die they decay, giving off water and gases to the air and matter to the soil. This is how matter is used over and over.

Green plants are the ultimate sources of food, clothing, shelter, and energy.

CONCEPTUAL SCHEME III

THE ENVIRONMENT MUST BE PROTECTED.

MAIN IDEA A

THE ENVIRONMENT IS CONTAMINATED (POLLUTED).

Topics

Water is being polluted.
Ex: Wastes are discharged into bodies of water.

Air all over the world is being polluted.
Ex: Automobiles discharge poisons into the air.

Land is being polluted through misuse and accumulation of waste and litter.
Ex: Vast amounts of natural land are being covered with concrete for roads and parking lots. There are growing numbers and sizes of dumps and junkyards.

The environment in general is being polluted. There is temperature, noise and visual pollution.
Ex: There are loud traffic and construction sounds, loud voices and music which are extremely harmful to human health.

MAIN IDEA B

POLLUTION OF THE ENVIRONMENT CAN BE CONTROLLED.

Topics

Man has the technical knowledge to control water pollution.
Ex: Wastes can be purified before being discharged into bodies of water.

Man has the technical knowledge to control air pollution.
Ex: He can develop alternate means of transportation that are comparatively free of pollutants.

Land pollution and misuse can be controlled.
Ex: Recycling of materials and careful land planning and zoning.

Pollution of the environment in general can be controlled.
Ex: Alternate means of transportation and construction machinery can be designed to be comparatively noise free.

CONCEPTUAL SCHEME IV

POPULATION SIZE IS REGULATED IN NATURE.

MAIN IDEA A

POPULATION GROWTH IS UNCONTROLLED.

Topics

Uncontrolled population growth in an environment causes a change in that environment and in the population, generally detrimental.

Ex: The food supply may become insufficient and many members of the population may starve to death. (Uncontrolled growth in a deer population results in the stripping of leaves from tree branches--overgrazing.)

Ex: The population shows increased aggressive behavior. (Large cities have a greater crime rate than less populated areas. Animals fight over limited resources.)

Ex: Processes of nature which generally purify air, soil, and water are limited and break down when overpopulation adds too many pollutants (industrial wastes, automobile emissions, sewage, solid wastes).

Ex: There is an increase in disease (lung diseases from air pollution, intestinal diseases from water pollution).

Ex: Members of a population tend to establish territorial boundaries. This area, known as the "home range" is defended against intruders, and is one of the factors which regulates population size.

MAIN IDEA B

POPULATION GROWTH MUST BE CONTROLLED.

Topics

Populations of an environment are automatically controlled by nature.

Ex: Many of the population starve.

Ex: Many young are abandoned by parents or destroyed by other members of the population (predators).

Ex: Many are forced to leave the area due to lack of space and other natural resources.

Ex: Many, weakened by lack of food or other resources succumb more easily to disease. Disease spreads more easily when the population is crowded. Nature provides natural diseases preventing population growth (many animals fail to produce offspring and parasites affect the growth of populations).

CONCEPTUAL SCHEME V

THE WORLD IS A FINITE SYSTEM WITH LIMITED RESOURCES.

MAIN IDEA A

RESOURCES HAVE BEEN MISMANAGED.

Topics

Natural resources supply all material things used by people.
Ex: Soil in interaction with plants is the primary source of food, clothing, and shelter.

People have used natural resources wastefully.
Ex: They use many "throw-away" products.

People have recklessly ruined land and waters in the process of acquiring natural resources.
Ex: Forests have been completely destroyed and turned into unproductive land.

Parks, wilderness areas, open spaces, and recreation areas are valuable to people.

People have thoughtlessly built cities and developed and misused lands destroying and neglecting to preserve natural areas.

Unpolluted waters are necessary to people's health and well-being.
Ex: They provide water for drinking, growing of food (both plants and animals) and for recreation.

Ex: Coastal areas, rivers, lakes, and streams can be a rich source of food (fish).

People have thoughtlessly polluted waters with litter, sewage, industrial wastes and dredging and filling projects.

Pollution has destroyed much of the wildlife in the oceans, rivers, lakes and streams.

MAIN IDEA D

TECHNICAL AND SOCIOLOGICAL KNOWLEDGE MUST BE APPLIED TO RETARD RESOURCE DEPLETION.

Topics

People must give up wasteful practices and unnecessary use of resources in order to preserve natural resources for the future.
Ex: They can manage their forests (replanting).

Ex: They can outlaw the use of "throw-away" products.

People and their governments must make plans and laws to provide for parks and recreation areas and for preserving natural wilderness areas.

Individuals visiting wilderness areas should leave them undisturbed so that they can be enjoyed at future dates and by other people.

Methods for treating sewage and industrial wastes must be employed. Dredging and filling must be carefully controlled.

CONCEPTUAL SCHEME VI

THE AVAILABLE TECHNOLOGICAL SOLUTIONS TO ENVIRONMENTAL PROBLEMS MUST BE IMPLEMENTED.

MAIN IDEA A

ROADBLOCKS PREVENT THE IMPLEMENTATION OF AVAILABLE TECHNOLOGICAL SOLUTIONS.

Topics

Many people do not understand that an unpleasant or unhealthy environment makes life unpleasant and unhealthy for those who live there.

Ex: The way your home and yard is kept.

Ex: The way your school environment is kept pretty, clean, reasonably quiet, and roomy.

Many people do not know enough about their environment and its interrelationships to make wise decisions.

Ex: Wasteful use of natural resources such as paper made from trees accelerates the depletion of those natural resources.

Many people do not show an appreciation and respect for the rights of others.

Ex: Making noise in an environment where others desire quiet.

Ex: Needlessly destroying or wasting materials.

MAIN IDEA B

ROADBLOCKS CAN BE REMOVED.

Topics

People can learn the importance of maintaining a pleasant and healthy environment for their own good and become actively involved in doing so.

People can learn many facts about their environment so that they are prepared to make wise decisions.

Ex: Children in school can conserve paper, reuse it, use both sides of it, and see that newspapers are recycled.

People can learn to appreciate and respect the rights of others, knowing that all things are interrelated and that what affects some people eventually affects all people.

I N T E R M E D I A T E

CONCEPTUAL SCHEME I

LIVING THINGS ARE INTERDEPENDENT WITH ONE ANOTHER AND THEIR ENVIRONMENT.

MAIN IDEA A

ENVIRONMENT IS THE SUM TOTAL OF ALL FACTORS LIVING AND NON-LIVING THAT INFLUENCE AN ORGANISM.

Topics

Man is an animal and is bound by the same biological principles as other animals.
Ex: Man needs food.

An organism is the product of its heredity and environment.
Ex: A naturally strong organism becomes weak when deprived of food.

Man is influenced by many of the same hereditary and environmental factors that affect other organisms and their populations.

Organisms live in communities, each community consisting of an interacting assortment of different kinds of organisms.
Ex: The vegetation-insect-small animal relationships of a wooded lot.

The community together with the non-living factors affecting that community comprise an ecosystem.
Ex: The water, air, weather, and other conditions.

The long-term evolution of ecosystems is shaped by outside forces, such as geologic and climatic changes, and inside forces or processes resulting from activities of the living components of the ecosystem.

There are characteristic ecosystems, each with unique populations.
Ex: A wooded lot, a beach, The Everglades.

The whole earth is actually one big environmental system. There is interaction between ecosystems as well as within ecosystems.

There are certain basic elements that make up all living material. These major elements are carbon, hydrogen, oxygen, and nitrogen.

MAIN IDEA B

ALL THINGS IN THE ENVIRONMENT ARE CONSTANTLY CHANGING.

Topics

All living things, including man, are continually evolving.
Ex: Prehistoric man.

The earth is constantly changing through the activities of all living things.
Ex: Formation of soil from sand with addition of living things.

Because of his ability to think and manipulate, man has a greater effect on the environment than any other single kind of organism.
Ex: The building of cities.

CONCEPTUAL SCHEME II

ALL ORGANISMS ARE INTERRELATED THROUGH MATTER AND ENERGY.

MAIN IDEA A

ALL ORGANISMS REQUIRE ENERGY WHICH IS CONTINUALLY SUPPLIED BY THE SUN.

Topics

Energy is essential for growth, maintenance, and reproduction.

Energy can neither be created nor destroyed. It can, however, be changed in form.
Ex: Heat, light, electricity.

Energy from the sun functions in heating the earth and initiating the earth's natural cycles.
Ex: Water and matter cycles.

Light energy from the sun and chlorophyll in green plants cause the plants to produce carbohydrates from carbon dioxide and water. This process is called photosynthesis.

In the process of photosynthesis green plants produce oxygen which both plants and animals need for respiration.

MAIN IDEA B

ALL ORGANISMS ARE INTERRELATED THROUGH FOOD RELATIONSHIPS.

Topics

The earth is a self-contained unit with no input of new matter. In order for life to continue, matter must be recycled.

This recycling is provided through food relationships.

Food relationships may be outlined by grouping organisms into levels.
Ex: The producers are largely green plants which convert the sun's energy and carbon dioxide and water into food for other living things.

The consumers are the organisms that feed on the green plants or other consumers.

The decomposers are organisms (bacteria, fungi, toadstools) that decay or break down other materials, returning the elements of which they are made to the soil, air and water.

The relationship of producers, consumers and decomposers is referred to as a food chain, but because many organisms are part of different food chains, it is actually more like a food web.

Ex: Snakes eat frogs and insects, frogs eat insects.

CONCEPTUAL SCHEME III

THE ENVIRONMENT MUST BE PROTECTED.

MAIN IDEA A

THE ENVIRONMENT IS CONTAMINATED (POLLUTED).

Topics

There are many types of water pollutants.
- Ex: Phosphates in detergents eventually enter bodies of water where they promote heavy algal blooms and lead to accelerated eutrophication.
- Ex: Many materials dumped on soils (pesticides and fertilizers) usually wind up in water where they cause contamination and eutrophication.

Many pesticides tend to accumulate in fatty tissues. They are concentrated with each step in the food chain.
- Ex: The effects may be felt more by large predators than by the pests for which they were intended such as insects and birds.
- Ex: Dumping of wastes in the oceans occurs in coastal areas, thus affecting the most productive regions.
- Ex: Improper disposal of human excrement is a common cause of water pollution.

Air pollution is extremely hazardous to human health.
- Ex: Polluted air irritates the air passages in organisms and increases deaths from such diseases as pneumonia, bronchitis, asthma and emphysema.

Litter is a very important pollutive consideration.
- Ex: It costs governments large sums of money.
- Ex: It lowers property values and mars scenic beauty.
- Ex: It is a health hazard, causing accidents, attracting disease-carrying organisms, polluting the air and water, etc.

All means of energy (electricity) production cause changes in the environment.
- Ex: Damming streams, nuclear thermal pollution, smoke from coal fire generating plants, etc.

MAIN IDEA B

POLLUTION OF THE ENVIRONMENT CAN BE CONTROLLED.

Topics

Man has the technical ability to develop detergents relatively free of phosphate and the option to use phosphate-free cleaning products.

There are non-polluting alternatives to the use of pesticides and chemical fertilizers.
Ex: Biological control of pests and compost fertilizing.

Pollution from wastes dumped into coastal areas could be greatly reduced through innovative waste control systems and through purification.

Reduction of pollution from human excrement may be accomplished through innovative systems of waste disposal, and more effective treatment systems.

The main causes of air pollution are the automobile, industries, power plants, and incinerators. This pollution can be decreased through technical modification, substitution, and limited use.

The majority of litter consists of unnecessary materials or poorly produced materials which rapidly become obsolete. Litter pollution can be controlled through reducing production of these types of materials and through recycling, reprocessing, and reusing necessary materials.

Changes to the environment through the production of electricity can be minimized through the use of less pollutive power sources (solar cells) and primarily through the curtailment of power use.

CONCEPTUAL SCHEME IV

POPULATION SIZE IS REGULATED IN NATURE.

MAIN IDEA A

POPULATION GROWTH IS UNCONTROLLED.

Topics

Overpopulation of humans in an environment results in changes within that environment and within the population.

Ex: There is an increased demand for natural resources resulting in accelerated depletion of those natural resources.

Ex: The crowding of people into cities results in slums, substandard housing, and depletion of natural areas.

Ex: Resources in overcrowded areas are often insufficient to meet demands (there is limited use of water, electricity, methods of transportation, recreational facilities, etc.)

Ex: The crowding of people into cities results in increased competition, aggressive behavior, crime, and drug abuse.

Ex: In overcrowded urban areas there is water, air, land, visual, noise, and thermal pollution.

Ex: Crowding and pollution are detrimental to the physical and mental health of people.

MAIN IDEA B

POPULATION GROWTH MUST BE CONTROLLED.

Topics

The numbers of organisms to which an environment is limited by nature is referred to as the "carrying capacity."

Human populations must regulate their own numbers or eventually be regulated by nature.

Human population must be regulated to insure against detrimental consequences to the environment and to the population.

Ex: Human populations must be regulated to insure the availability of natural resources.

CONCEPTUAL SCHEME IV - MAIN IDEA B - Topics (Cont'd.)

Ex: The adverse effects of urban life can be counteracted by planning and regulating population densities. (Present urban complexes can be limited; "new cities" can be ecologically designed to provide for specific numbers of citizens.)

CONCEPTUAL SCHEME V

THE WORLD IS A FINITE SYSTEM WITH LIMITED RESOURCES.

MAIN IDEA A

RESOURCES HAVE BEEN MISMANAGED.

Topics

Natural resources may be classified as "renewable" and "non-renewable."

"Renewable" resources are those which can be replenished fast enough for man to use.

Ex: All living things (plants and animals) and non-living things which are able to renew their purity such as air, soil, and water.

"Non-renewable" resources are those which cannot be replenished fast enough for man to use and are considered finite.

Ex: Fossil fuels, such as coal and petroleum-related products, minerals, and ores.

The living and non-living environments are functionally inseparable; the living is dependent on the non-living for life, and the composition of the non-living is influenced by the living.

Ex: The environment influences the behavior of an organism.

Ex: The earth and life on it are greatly affected by the atmosphere.

Ex: Soil on which plants are growing erodes much less than soil on which no plants are growing.

Ex: Many aspects of the quality of life depend upon the management and products of the soil.

Ex: Trees (forests) aid in flood control.

Ex: Ready transportation, growing interest, money surpluses, and increased leisure time combine to deteriorate and pollute existing recreation facilities and natural areas, harming natural foliage and wildlife which are important economically, aesthetically, and biologically.

Ex: Man has hastened the extinction of certain animal species and created imbalances in wildlife populations through thoughtless manipulation of the environment.

The amount of precipitation that becomes available for use by man varies with topography, land use, and management practices.

Human resources should be considered as one of the important natural resources. They include the physical and mental abilities with which man is endowed and the knowledge he has generated.

MAIN IDEA B

TECHNICAL AND SOCIOLOGICAL KNOWLEDGE MUST BE APPLIED TO RETARD RESOURCE DEPLETION.

Topics

Renewable living resources can be extended by production, growth, and management.

Non-living resources, which are able to renew their purity, must be managed to prevent reduction in available quantity and impairment of quality.

Man's lack of understanding of the interdependency of the living and non-living factors in his environment has resulted in its deterioration. An awareness of the necessity for environmental protection should result in the implementation of technological solutions.

Ex: He must realize the importance of beauty and nature to his well-being and plan accordingly.

Ex: He must implement air pollution policies (industrial and automobile emission controls).

Ex: Scientific farming and soil restoration projects must be employed.

Ex: Land use plans and environmental impact studies must guide land use policies.

Ex: The inhabitants of areas rich in natural resources must realize the necessity of preserving and sharing those resources.

CONCEPTUAL SCHEME VI

THE AVAILABLE TECHNOLOGICAL SOLUTIONS TO ENVIRONMENTAL PROBLEMS MUST BE IMPLEMENTED.

MAIN IDEA A

ROADBLOCKS PREVENT THE IMPLEMENTATION OF AVAILABLE TECHNOLOGICAL SOLUTIONS.

Topics

Man has not felt a moral responsibility for his environmental decisions due to his ignorance of his interrelationship with the environment.

The relationships between man and the natural environment generally depend upon learned behavior, customs, habits, attitudes, institutions, and lifeways of his culture.

Often these customs, habits, attitudes, institutions, and lifeways of a culture have been incompatible with environmental preservation.

The relationship between an individual and his personal conservation behavior reflects his social values and mores.

Public apathy and antagonism toward environmental legislation retards the implementation of technological solutions and legislation to control environmental degradation.

MAIN IDEA B

ROADBLOCKS CAN BE REMOVED.

Topics

Man can be helped to understand his moral responsibility for his environmental decisions through studying his interrelationship with the environment.

Ex: His dependence upon the automobile has increased sickness and expedited death.

As environments become progressively degraded, customs, habits, attitudes, institutions and lifeways of various cultures must either change for the preservation of that culture or lead to its demise.

Ex: pre-Civil War South
Rome

CONCEPTUAL SCHEME VI - MAIN IDEA B - Topics (Cont'd.)

Education is necessary for combating social values and mores which promote behavior incompatible with conservation practices.

The public, which constitutes a control over environmental legislation, when adequately educated on the subject, and with good leadership, can promote legislation necessary to deal effectively with environmental problems.

M I D D L E

CONCEPTUAL SCHEME I

LIVING THINGS ARE INTERDEPENDENT WITH ONE ANOTHER AND THEIR ENVIRONMENT.

MAIN IDEA A

ENVIRONMENT IS THE SUM TOTAL OF ALL FACTORS LIVING AND NON-LIVING THAT INFLUENCE AN ORGANISM.

Topics

All living organisms have basic needs. The environment can provide for these needs.
Ex: Water.

There are certain basic elements that make up all living material. These major elements are carbon, hydrogen, oxygen, and nitrogen.
Ex: Water is made up of oxygen and hydrogen.

All of these basic elements are cyclical.
Ex: The hydrologic cycle.

The long-term evolution of ecosystems is shaped by outside forces, such as geologic and climatic changes, and inside forces or processes resulting from activities of the living components of the ecosystem.
Ex: Drought and pollution.

There are characteristic ecosystems, each with unique populations.
Ex: A mangrove swamp, a hammock, The Everglades, North America.

The form of life present depends upon the coincidence of the life needs and their availability in an environment.
Ex: Urbanization.

MAIN IDEA B

ALL THINGS IN THE ENVIRONMENT ARE CONSTANTLY CHANGING.

Topics

All living things continually evolve as they adapt to a constantly changing environment.

The shorter the life cycle of an organism, the faster evolution may proceed and thus the easier it is for that organism to meet changes in the environment.

Ex: DDT was used to kill the common housefly. Those with some natural immunity lived, mated, and produced offspring even more immune to DDT.

All environments are constantly changing. These changes are generally orderly and progressive, one community replacing another.

Ex: A field builds into a forest, a body of water is filled in by dying plant and animal life within it.

Man and technology have caused such rapid changes in the environment and speeded up succession to such a degree that many organisms are unable to adapt.

Ecological research indicates that many apparently insignificant changes effected by man can alter the environment significantly.

Ex: Addition or removal of a single species will result in a change of interrelationships within a community.

CONCEPTUAL SCHEME II

ALL ORGANISMS ARE INTERRELATED THROUGH MATTER AND ENERGY.

MAIN IDEA A

ALL ORGANISMS REQUIRE ENERGY WHICH IS CONTINUALLY SUPPLIED BY THE SUN.

Topics

All life processes are dependent upon energy in its various types and forms.

Ex: Heat, light, electric, atomic, potential, kinetic, mechanical, chemical.

Energy from the sun is stored in chemical form. The breaking and combining of chemical bonds results in release of energy used by life.

Ex: Photosynthesis, digestion, and decomposition.

When chemical bonds are broken and energy is transferred or transformed, some of the energy is degraded to a more dispersed (less useful) form. This means that energy flow through biological systems on earth cannot be cyclic. There must be a continuous external source (the sun).

MAIN IDEA B

ALL ORGANISMS ARE INTERRELATED THROUGH FOOD RELATIONSHIPS.

Topics

The earth is a finite system. Though matter changes from one form to another, the total amount of matter remains the same.

Ex: The cycling of matter through the food chain and the photosynthetic process.

Producers, consumers, and decomposers are essential to the cycling of the major elements--carbon, hydrogen, oxygen, and nitrogen.

CONCEPTUAL SCHEME III

THE ENVIRONMENT MUST BE PROTECTED.

MAIN IDEA A

THE ENVIRONMENT IS CONTAMINATED (POLLUTED).

Topics

Because water pollution results in infinite alterations to the environment it must be controlled on a regional, national and international basis.

Ex: Damming of streams and rivers results in social, political, economic, and numerous other effects in addition to the immediate alteration of the physical environment.

Ex: Water pollution is extremely hazardous to health, resulting in, among other things, the spread of typhoid fever, dysentery, cholera and hepatitus.

Scientists differ in theories concerning the effect that unchecked atmospheric pollution may have upon the earth. The majority of the theories deal with detrimental effects.

Ex: Some believe changing levels of gases in the atmosphere will produce a heating effect on the earth's surface resulting in the melting of polar ice caps.

The pollution of land is increasing.

Ex: At this time the one ton of solid waste disposed of annually per American is increasing.

Ex: The disposal of this waste is increasing the pollution problem because present methods are inadequate, occupy land areas, and contribute to other types of pollution (air, water, visual, noise, temperature).

Safe waste disposal methods, including the reduction of harmful and cumulative effects of various solids, liquids, gases, radioactive wastes, and heat should be implemented not only for the preservation of the environment, but for the well-being of man.

MAIN IDEA B

POLLUTION OF THE ENVIRONMENT CAN BE CONTROLLED.

Topics

Decisions for making major alterations in the environment should be based upon overall impact studies involving specialists from all areas of the environment to be affected.

Diseases caused by pollution of water can be curtailed worldwide through international cooperation involving education dealing with modern waste disposal and treatment methods and modern medical techniques.

Man can control the discharge of pollutants into the atmosphere through technology and legislation.

The amount of solid wastes can be reduced to a minimum through abandoning the practice of planned obsolescence, and through recycling, reusing, and reprocessing.

The problem of increasing solid waste will, to a great extent, be alleviated with the abandoning of planned obsolescence and the adoption of the widescale practice of reusing, reprocessing, and recycling.

Technology and/or legislation can control the emission of substances harmful to both the environment and the well-being of man.

CONCEPTUAL SCHEME IV

POPULATION SIZE IS REGULATED IN NATURE.

MAIN IDEA A

POPULATION GROWTH IS UNCONTROLLED.

Topics

The carrying capacity of the earth is limited (as well as that of any given environment).

Pollution and ecological problems can be eased, but not solved without first solving the population problem.

As the world population increases, there is increasing competition for resources, causing complex social-political-economic problems.

As populations increase and resources decrease, the freedom of individuals and nations to use the resources as they wish decreases.

MAIN IDEA B

POPULATION GROWTH MUST BE CONTROLLED.

Topics

Even before the carrying capacity of an ecosystem is reached, the population cannot be sustained at an acceptable level of nutrition.

Ex: Overgrazing of lands.

When the carrying capacity is reached there is often famine and mass starvation.

CONCEPTUAL SCHEME V

THE WORLD IS A FINITE SYSTEM WITH LIMITED RESOURCES.

MAIN IDEA A

RESOURCES HAVE BEEN MISMANAGED.

Topics

Many of the problems of the world today are due to our mismanagement of the environment and inefficient use of resources.

Man's acquisition of natural resources for economic gain has resulted in manipulation of the natural environment.

There is a lack of consideration for the economic value of the environment.

Damage to the environment is not considered as having a monetary value when costs are being calculated for projects.

Immediate economic efficiency accelerates the depletion of natural resources.

Consumption practices are being expanded constantly by our ability to produce and create wants and markets, which accelerates the rate of resource use.

Man currently is jeopardizing the future survival of the race through the measures he employs in improving his standard of living.

MAIN IDEA B

TECHNICAL AND SOCIOLOGICAL KNOWLEDGE MUST BE APPLIED TO RETARD RESOURCE DEPLETION.

Topics

Environmental management involves the application of knowledge from many disciplines.

The political and economic strength of a country is, in part, dependent upon its access to domestic and foreign resources and international relationships.

CONCEPTUAL SCHEME V - MAIN IDEA B - Topics (Cont'd.)

A variety of institutional structures including political and economic interests is valued in planning and managing the environment.

Conservation policy is determined by the interaction of science and technology; social and political factors; and aesthetic, ethical, and economic considerations.

Long-range planning for the use and allocation of natural and human resources is continually evolving.

Choices between needs (essentials) and wants or desires (nonessentials) are often in conflict.

Supply and demand, in relation to values held by society, determine what is a resource and its economic value.

Since resources are limited, man must reuse and recycle the products of his technology. He must conserve and carefully manage his resources so as not to exhaust his supply.

Environmental options available to future generations must not be foreclosed.

CONCEPTUAL SCHEME VI

THE AVAILABLE TECHNOLOGICAL SOLUTIONS TO ENVIRONMENTAL PROBLEMS MUST BE IMPLEMENTED.

MAIN IDEA A

ROADBLOCKS PREVENT THE IMPLEMENTATION OF AVAILABLE TECHNOLOGICAL SOLUTIONS.

Topics

Government at the national, state, and local levels has the supreme authority for directing resource management and/or settling disputes concerning resource management.

In a democracy, increasing restrictions on resource allocation and use are imposed by the consent or insistence of the people.

Democratic governments are often affected by political pressure groups in their decision-making process.

Political pressure groups differ greatly in their emphasis on the utilization of natural resources.

Ex: Some are petitioning for conservation of natural resources, while others are lobbying for increased resource use in the name of progress.

Too often government has responded to pressure groups who desire widespread use of natural resources in the name of progress.

Too often courts have interpreted human rights in ways which condone the misuse of natural resources.

Ex: It is often believed that a man has a right to do what he pleases with his property. Should one deplete the natural cover of his land, soil erosion problems may arise which affect the natural resources on other people's property and even threaten their lives.

An extremely large population not only depletes natural resources but also makes a democratic way of government more difficult and leads to increased domestic and international conflict.

CONCEPTUAL SCHEME VI (Cont'd.)

MAIN IDEA B

ROADBLOCKS CAN BE REMOVED.

Topics

Knowledge of social structures, institutions, and culture of a society can be brought to bear on governmental environmental considerations.

Man has the capability of improving society through sociology, psychology, and science.

S E C O N D A R Y

CONCEPTUAL SCHEME I

LIVING THINGS ARE INTERDEPENDENT WITH ONE ANOTHER AND THEIR ENVIRONMENT.

MAIN IDEA A

ENVIRONMENT IS THE SUM TOTAL OF ALL FACTORS LIVING AND NON-LIVING THAT INFLUENCE AN ORGANISM.

Topics

This interdependence must be examined in terms of its social aspects.

The history of a people evolves through interaction of individuals, groups, cultures, and events.

The economy of a people evolves through interaction of individuals, groups, cultures, and events.

The culture of a group develops out of the interaction of regional, behavioral, and ethnic factors.

The culture of groups stems from interaction among individuals and their groups.

MAIN IDEA B

ALL THINGS IN THE ENVIRONMENT ARE CONSTANTLY CHANGING.

Topics

This interdependence must be examined in terms of evolution.

The long-term evolution of ecosystems is shaped by outside forces, such as geologic and climatic changes, and inside forces or processes resulting from activities of the living components of the ecosystem.

The genetics of an organism may be changed by changes in environmental factors.

Wildlife refuges, undisturbed natural areas, and preserves may be of value in protecting endangered species and perpetuating the gene pool.

A diverse biological community or culture perpetuates diversity within the gene pool.

There are causes for changes in the environment.

Changes in the environment affect the organisms present.

The rate of change in an environment may exceed the rate of organism adaptation.

Communities with few numbers of species are much less stable than communities with larger numbers of species. The less diverse a community, the more it will be affected by environmental changes.

Ex: In a cave ecosystem the removal of one species can destroy the whole ecosystem.

CONCEPTUAL SCHEME II

ALL ORGANISMS ARE INTERRELATED THROUGH MATTER AND ENERGY.

MAIN IDEA A

ALL ORGANISMS REQUIRE ENERGY WHICH IS CONTINUALLY SUPPLIED BY THE SUN.

Topics

Energy from the sun is stored in chemical form. The breaking and combining of chemical bonds results in release of energy used by life.

Energy is essential for growth, replacement, maintenance and reproduction.

The earth receives a constant input of energy from the sun. The part of this energy that is trapped by green plants serves as the basis for life. Since there is a constant input of energy, energy does not need to be recycled for life to continue.

The role of the heating of the earth's crust is important.
Ex: Energy from the sun functions in heating the earth.

MAIN IDEA B

ALL ORGANISMS ARE INTERRELATED THROUGH FOOD RELATIONSHIPS.

Topics

In food chains the inefficient conversion from one step to the next, about 10% efficiency, reduces the total biomass (unit volume of living things in a habitat).
Ex: As a consequence of inefficient energy transfer, each level (primary consumer, secondary consumer, etc.) has a smaller total biomass than the level below it. For example, 100 pounds of producers may support only 10 pounds of primary consumers, which may support only one pound of secondary consumers. The result is a "food pyramid."

The natural situation in food relationships is really more like a web than a chain.

All organisms require matter which must be recycled since there is no continuous input.

Biological systems are described as dynamic because the materials and energy involved are parts of continuous cycles; inorganic materials and energy become part of organic materials and are subsequently broken down into simpler substances and energy as a result of the operation of organic systems.

All organisms are interrelated with the non-living or physical part of the environment.

Because of adaptation to a particular place in the environment, each type of organism can only live within certain environment stress limits.

CONCEPTUAL SCHEME III

THE ENVIRONMENT MUST BE PROTECTED.

MAIN IDEA A

THE ENVIRONMENT IS CONTAMINATED (POLLUTION).

Topics

Dumping organic wastes into water increases microbial activity which results in a decrease in the oxygen content of the water (B.O.D.).

Metallic pollution of water and air destroys certain food sources and may cause cancer and nervous system disorders.

MAIN IDEA B

POLLUTION OF THE ENVIRONMENT CAN BE CONTROLLED.

Topics

Adequate regulation of soil erosion and the dumping of wastes into water must be enforced.

Alternative power systems which emit much fewer pollutants must be developed.

A land ethic must be developed, defining man's responsibilities to his environment.

The detrimental effects of chemical pest control may more than offset any benefits.

Ex: Before a pest control program is initiated, careful consideration should be given to the overall effect on the environment.

Architecture can be one of the positively persuasive influences in developing a congenial environment.

Thermal pollution and other adverse effects of radioactivity must be controlled.

Noise pollution and visual pollution must be controlled and regulated.

CONCEPTUAL SCHEME IV

POPULATION SIZE IS REGULATED IN NATURE.

MAIN IDEA A

POPULATION GROWTH IS UNCONTROLLED.

Topics

Organisms invading new environments show typical population growth curves.

S-shaped population growth curves start with a slow growth rate which increases to an extremely fast rate and then slows again as the population reaches the carrying capacity. Population size then varies around the carrying capacity level.

J-shaped growth curves are similar to S-shaped curves but instead of leveling off near the carrying capacity, the population shoots way above it. The result is massive die-off due to such things as lack of food, lack of cover, epidemic diseases, etc.

The interaction of environmental and biological factors determines the size and range of species and populations.

Although plants cannot actively defend a territory, many show spatial distributions influenced by secretion of substances which inhibit the growth of members of the same species close to them.

Increasing population and per capita use of resources have brought changed land-to-man or resource-to-population ratios.

Widespread implementation of family planning information is impeded by religious and cultural beliefs.

An expanding economy has been linked traditionally with an expanding population.

CONCEPTUAL SCHEME IV (Cont'd.)

MAIN IDEA B

POPULATION GROWTH MUST BE CONTROLLED.

Topics

A public awareness of the effects of overpopulation on the environment must be developed.

In order to reverse current population trends, couples should consider limiting the number of offspring per family.

Mass media programs on the effects of overpopulation on the environment must be increased.

Family planning information should be made available to everyone.

It is more humane to lower the human birth rate than to perpetuate conditions which will eventually increase death rate.

Family planning and the limiting of family size are important if overpopulation is to be avoided and a reasonable standard of living assured for successive generations.

A special effort must be made to provide family planning information to individuals of low socio-economic status.

CONCEPTUAL SCHEME V

THE WORLD IS A FINITE SYSTEM WITH LIMITED RESOURCES.

MAIN IDEA A

RESOURCES HAVE BEEN MISMANAGED.

Topics

A satisfactory level of physical, psychological and social health for man depends upon an optimum level of environmental stress.

Reduction of environmental stresses from excessive to optimum levels results in a feeling of well-being.

There are sensory prerequisites to the appreciation of the cultural heritage.

An increase in input (capital, labor, resources) will produce a proportionate increase in production or benefits up to a limit defined as the margin of diminishing returns.

The management of natural resources to meet the needs of successive generations demands long-range planning.

Conventional benefit-cost analyses do not always result in sound conservation decisions.

Individuals, corporations, etc., tend to select short-term economic gains, often at the expense of greater long-term environmental benefits.

Raw materials and energy supplies are generally obtained from those resources and places where they are available at least cost, usually in short economic terms.

Economic efficiency does not always result in conservation of a natural resource.

Conflicts emerge between private land use rights and the maintenance of environmental quality for the general public.

Urban sprawl, and other consequences of insufficient land use regulation, contribute to a decline in the quality of the environment.

MAIN IDEA B

TECHNICAL AND SOCIOLOGICAL KNOWLEDGE MUST BE APPLIED TO RETARD RESOURCE DEPLETION.

Topics

A sound natural resource policy is dependent upon a flexible political system, pragmatically appraising and reappraising policies and programs in terms of their effect upon the public interest and in light of scientific knowledge about the natural resources.

Regulate land use with consideration for both man and the environment.

Zoning is a practice in which land uses are prescribed based upon value judgments regarding the needs of society.

Man's psychological needs should be considered in regulations for land use and development.

Community planning can result not only in technical efficiency but also in aesthetically pleasant surroundings. Both results are important if a community is to function smoothly.

Multiple use is a practice in which a given land area functions in two or more compatible ways. Use of land for two compatible functions can result in greater benefit to man than use for only one function. Total productivity is greater.

CONCEPTUAL SCHEME VI

THE AVAILABLE TECHNOLOGICAL SOLUTIONS TO ENVIRONMENTAL PROBLEMS MUST BE IMPLEMENTED.

MAIN IDEA A

ROADBLOCKS PREVENT THE IMPLEMENTATION OF AVAILABLE TECHNOLOGICAL SOLUTIONS.

Topics

Decisions in society are made through the interaction of countervailing power structures.

A community has its customs, traditions, values and beliefs rooted in the past of the individuals and groups which compose it.

Natural resources affect and are affected by the material welfare of a culture and directly or indirectly by philosophy, religion, government, and the arts.

Many individuals become apathetic regarding the use of natural resources when they are not taught the adverse effects of their misuse and mismanagement.

Many individuals believe that environmental problems are caused by someone else and they should have no part in correcting them.

Many individuals feel that they are a small part of a great mass of people and can do little to overcome environmental problems.

Increased population mobility is changing the nature of the demands upon some resources.

Historically, cultures with high technological development have used more natural resources than those with lower levels of technological development.

A culture and time lag exists between the development of knowledge in science and technology and application of that knowledge to resource and environmental problems.

Natural resources have an economic value as long as they are potentially useful, whether directly or indirectly, for human consumption.

As a community becomes more developed, there is an increased demand on natural resources and an increase in their economic value.

Individuals and industries often use resources and dispose of wastes as if the environment had no economic value.

Whenever individuals or industries deplete the land of natural resources, they often fail to restore it.
Ex: Strip mines leave the land unsightly and deplete its economic value.

Political roadblocks prevent implementation.

MAIN IDEA B

ROADBLOCKS CAN BE REMOVED.

Topics

Individuals perceive different self-roles depending upon their position in the social and environmental context.
Ex: They must engage in wise conservation practices in their home and business life and support conservation programs of private organizations and the government.

Man has the technology to solve present environmental problems but he often fails to use it, generally because it seems too costly.

Businesses and individuals can be pressured into using the technology available to solve environmental problems by:

1. public opinion
2. educational programs
3. consumer purchasing policies
4. government regulation.

Individuals and businesses must be required to restore land which they deplete.

We all may have to curtail our spending for luxury goods in order to conserve our natural resources.

Individual citizens should be stimulated to become active in the political process.

We have "legal" ownership of some resources like real estate and control over others during our lifetime, but ethically we are "stewards" rather than owners of the resource base.

Policies, including natural resource policies, came about as the result of interacting social processes: science and technology, government operations, private interests, and public attitudes.

Conservation policies are often the result of group action.

Procedures must be developed concerning the best methods of ensuring that government at all levels will be responsible for strictly regulating the management of natural resources and conducting environmental education programs.

Ex: Guidelines must be established to direct governmental decision-making regarding the environment and insure that governments will not favor private interest groups over the welfare of the majority.

Ex: The government's natural resource policy must be re-evaluated continuously in terms of its effect on the public interest and in light of scientific knowledge about natural resources.

Ex: Environmental impact studies should be compiled and used as a basis for decisions.

In a nation having a democratic form of government, a sound governmental conservation policy can be implemented after massive public opinion is aroused and individuals are willing to make financial and other sacrifices necessary for the implementation of such a policy.

A new concept of individual rights must be implemented to protect the environment, whereby a person is not permitted to use his property in such a manner that the environment and other people will suffer.

In order to safeguard democracy and reduce domestic and international conflict as well as enhance the quality of life, population control programs are necessary.

As competition for scarce natural resources continues, establishment of priorities by governments will become necessary.